

REMARKS

Claims 1-7 and 15 are all the claims pending in the application. Claims 1-4 stand rejected. New claims 26-29 have been added. Claims 5-7 and 15 are withdrawn from consideration.

Election/Restriction

The Applicants acknowledge their election without traverse of claims 1-4 for examination.

Claim Rejections - 35 U.S.C. § 102

Claims 1-4 are rejected under 35 U.S.C. § 102 (b) as being anticipated by Alumot et al. (5,699,447). This rejection is traversed.

The Invention

The present invention is directed to a method and apparatus for detecting defects or suspected defects on the surface of patterned semiconductor wafers using pixel based inspection rather than requiring a comparison of patterns (see the present specification at page 7, lines 1-3). Specifically, a first aspect of the invention requires scanning the individual pixels of a semiconductor wafer, defining a signature of each pixel, and determining whether the pixel signature has characteristics of a faultless or defective pixel (see page 11, lines 2-7). In a second aspect of the invention, preliminary steps are performed to reduce the amount of processing data by evaluating the characteristics of individual signals to determine if pixel signature cannot belong to defective pixels (see page 11, lines 9-15).

Independent method claim 1 is specifically directed to a method for detecting defects on semiconductor wafers and requires, the steps of:

- (1) checking individual pixels of a surface under control,

(2) detecting suspected pixels by collecting the signature for each pixel, and

(3) determining whether the signature has the characteristic of a signature of a faultless pixel or a pixel that is defective or suspected to be defective.

The focus of the claim is on a “pixel-based analysis.” The dependent claims also refer to the signature of a pixel. The term “pixel” as used in the claims and in the specification, refers to “the area [of the wafer] covered by the spot of the beam at the moment the sampling is carried out” (see the present specification at page 16, lines 19-22). The term “pixel” is not used in the traditional sense to mean an element of a display image. Indeed, the “pixel” referenced by the claims can project above a plane and can overlap or be apart, as explained at page 17, lines 1-8.

The importance of the pixel-based inspections is that they can be performed without requiring reference pattern data, and can classify the acceptable pixels and suspect pixels. In particular, the invention includes inspecting all or part of the individual pixels of a patterned wafer, without comparing patterns or needing specific information about the patterns (see the present specification at page 9, line 25 to page 10, line 2). One exemplary embodiment of the invention scans individual pixels and defines a signature of each pixel to determine whether the signature has the characteristics of a signature of faultless or of a defective pixel (see the present specification at page 11, lines 1-7). The invention relies upon a comparison of “pixel signatures” to a master signature, but this does not encompass a comparison of pattern data. The definition of a pixel signature is based upon the light scattered by the pixels, as provided at page 15, line 5- page 16, line 5.

Alumot et al

Alumot et al. is disclosed in the “Background of the Invention” section of the present specification (see page 5, line 25 to page 10, line 12). Alumot et al. is deficient because it

teaches a method and device requiring a comparison between the inspected pattern and a reference pattern (see Alumot et al., col. 2 lines 4-49). Alumot et al. fails to teach or suggest performing pixel-based inspections without requiring reference pattern data. Indeed, Alumot et al. merely discloses a first examining phase that examines the complete surface of a semiconductor device and outputs locations of suspected defects by comparing the inspected pattern with a reference pattern (see Alumot et al., col. 2, lines 6-9 and lines 34- 36). Alumot et al. further discloses a second examination phase which optically examines with high resolution only the suspected defect locations provided by the first phase and by comparing the inspected pattern and the reference pattern (see Alumot et al., col. 2, lines 10-13 and lines 39-45). Thus, Alumot et al. suffers from drawbacks of prior art systems requiring high mechanical precision, long operation times, and low throughput.

In view of the foregoing differences between claim 1 and Alumot et al., based on the difference between a pixel-by pixel analysis, rather than a pattern by pattern analysis, Applicants respectfully request the Examiner to reconsider and allow these claims. Additionally, Applicants respectfully submit that claims 2-4 are allowable at least by virtue of their dependency. Similarly, new claims 26-29, which are directed to the same invention as claim 1 but with a different focus, as described at pages 28-35 of the specification, are patentable.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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Respectfully submitted,

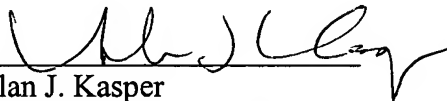
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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 26-29 are added as new claims.

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